

An exploration of the factors that determine the gendered adaptation to climate variability in Kilosa District, Tanzania

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Abstract

Adaptation is reflected as a suitable response to climate variability, particularly for smallholder farmers. Yet, adaptation by women and men farmers may be influenced by different factors that are not well understood. That is, there is a gender dimension to the choice of an adaptation strategy to climate variability. The study employed a qualitative research design to explore the factors that determine the adaptation to climate variability by women and men. The study findings indicate that climate variability adaptation of men and women depends on farm size, access to credit, financial resources, access to information, and access to extension services and training. However, the factors vary significantly between women and men. Although women predominate in the provision of agriculture labour force, men dominate the decision making in allocating labour as well choosing what crop to grow and sell.

Keywords: Adaptation, climate variability, men and women and smallholder farmers

1.0. Introduction

Changes in climate trends over the past few decades have been impartially speedy in several agricultural areas around the world. An increase in atmospheric carbon dioxide (CO₂) and Ozone (O₃) levels have increased everywhere (Lobell and Gourdjji, 2012). The catchphrase for the mentioned trends is climate variability. The term “Climate Variability” is often used to symbolize deviations of climatic statistics over a given period of time (e.g. a month, season or year) when compared to long-term statistics for the same calendar period (see Cox *et al.*, 2018). Climate variability in this study means changes in weather events that occur in kilosa for a certain period (e.g. a month, season or year) these changes include a change in the onset of rainfall, temperature and lack of rainfall or heavy rainfall.

There is sufficient evidence that climate variability is having serious effects on agricultural production and the livelihoods of millions of farmers in Tanzania and elsewhere in the world (Velepini *et al*, 2018; Mung’ong’o, *et al*, 2019). It is also evident that women and men experience climate variability impacts differently due to their socially constructed roles and responsibilities. Climate variability affects the availability of water in developing countries, and as a consequence rural women, who are commonly given the task of fetching water, have to cover greater distances to collect water (FAO, 2016; Mung’ong’o, *et al*, 2019). Studies have also shown the strong link between climate-related disasters and women mortality, with women 14 times likely to die than men during a disaster (Peterson, 2007; DFID, 2013).

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Furthermore, the observable increase in women's responsibilities in agriculture is a result of increasing diversification out of family farming, which is being driven by demographic pressures and land fragmentation. It also reflects the intensification of agricultural production, which affects the labour demand for women and men. The growth of jobs in other sectors and significant male out-migration from rural areas is another factor that is increasing women's workload (Slavchevska *et al.*, 2016). Women often have more limited rights than men, limited mobility, and less access than men to resources, information, and decision-making authorities. Consequently, they are significantly more vulnerable to the impacts of climate variability and have fewer capacities to adapt and diversify their livelihood options (Velempini *et al.*, 2018; Mung'ong'o, *et al.*, 2019).

According to Frank *et al.* (2014), lack of resources and socio-economic limitations can impair farmers' adaptation decision-making even when they identify high risks. Smallholders' adaptation decision-making is based on independent determinants of adaptive capacities, such as farmers' perception of climate risks and self-perceived adaptive capacity (Grothmann *et al.*, 2005). Consequently, to respond to climate variability impacts, researchers may consider both objective determinants (e.g. financial or physical capital) and subjective determinants (e.g. how individuals and communities perceive the process of adaptation and their self-efficacy of adaptive capacity into upcoming climate variability adaptation programs). The degree to which people are affected by climate variability and its impacts is moderately a function of their social status, gender, poverty, power, and access to, and control over, resources (Hebtzezion, 2013).

In recent years, Tanzania has witnessed several climate-related disasters namely, flooding, droughts, widespread crop failures, livestock deaths, and intensification of climate-sensitive diseases among others (URT, 2010; Mung'ong'o *et al.*, 2019; Johnson *et al.*, 2020). Paddy is among the crops affected by climate variability particularly in Kilosa district (Mung'ong'o and Mwamfupe, 2003). Furthermore, this variability has influenced poverty, land conflicts between pastoralists and farmers, scarcity of pasture and water resources, an outbreak of diseases, livestock death, and school drop-out (Mung'ong'o and Mwamfupe 2003). To lessen the adverse impacts of climate variability, local farmers have adjusted to severe weather conditions and have already developed adaptation practices over time. Smallholder farmers have adapted to climate variability through crop-livestock diversification, use of improved varieties, chemical fertilizers, and pesticides, diversification of income-generating activities, changing planting dates, crop rotation, resistant crops, and migration (Belay *et al.*, 2017). The uptake of these practices and technologies, nevertheless, depends on individual characteristics, inequalities in household capital endowment, and access to rural services including climate and agricultural information (Adger *et al.*, 2009; Oyekale *et al.*, 2009; Nelson, 2011). In particular, much remains to be learned on how differently men and women are adjusting to harsh weather conditions and why they are taking up specific practices. Consequently, this study intended to examine important factors that influence paddy farmers' adaptation to climate variability and associated gendered implications. The study question is what are the factors influencing adaptation to climate variability among men and women paddy smallholder farmers?

The study was conducted in Kilosa district in 2019. Kilosa is one of the five administrative districts of the Morogoro region. The district was selected because for a long period it has gone through conflict over resource use between and farmers and pastoralists that occurred in the past (Maganga, Odgaard, and Sjaastad 2007) which was a result of climate variability. The district is categorized into three physio-geographic units namely mountains and upland, plateaus, and flood plain (Shishira *et al.* 1997). The mountains and upland, which lie at an altitude of 2200 m, consists of the Eastern Arc Mountains namely Ukaguru, Rubeho, and

Vidunda (KDC, 2010). Kilosa district has a typical tropical semi-arid type of climate regulated by seasonal movements of the inter-convergence zone (Misana *et al.* 1997). More than 80 percent of people in Kilosa depend on agriculture (KDC, 2010) and with its varied conditions, ranging from a plateau characterized by seasonally flooded plains, to mountainous areas with altitudes surpassing 2000m. A variety of food crops grown in the district including maize, paddy, millet, cassava, beans, bananas, and cowpeas. Besides food crops, the main cash crops are sisal, cotton, coffee, wheat, cashew nuts, coconuts, sugar cane, and tobacco. Small-scale farming where the average farmland is less than one hectare represents 90 percent of agriculture, with large scale farming representing the other 10 percent. The small-scale farm holders are subsistence farmers who produce mostly for domestic use, selling only their surplus.

1.1. Problem Statement

The agricultural sector is considered to be principally vulnerable to existing and future climate risks because of the low adaptive capacity of farming communities. This is due to a lack of education and technical skills, poverty, as well as lack of assets and capital to recover or to shift to alternative livelihoods (Oyekale *et al.*, 2009; IFAD, 2014; Le Dang *et al.*, 2014b). Some scholars have indicated that adaptation literature characterized adaptive capacity as a dynamic concept (Vincent, 2007; Eakin *et al.*, 2008). According to Lemos *et al.* (2016), adaptive capacity includes specific capacities and associated tools and skills that enable actors to foresee and efficiently respond to a specific pressure.

Kilosa District in recent years has been experienced changes in some weather conditions. There are some changes in climatic condition. The changes includes dry spells, short-time heavy rains, and temperatures increases (URT, 2009; URT, 2011). The most destructive floods in the district occurred in 2009. The floods caused massive deaths of animals, people, destruction of infrastructures, and destruction of crops in the farms and a big loss of pasture (Mung'ong'o and Mwamfupe, 2003). Apart from the effects of floods, farmers in kilosa were also negatively affected by droughts through scarcity of water and pasture leading to conflicts between farmers and pastoralists (Mung'ong'o and Mwamfupe, 2003). Droughts in Kilosa District have also been reported in other areas like *Rudewa*, *parakuiyo*, *twatwatwa*, and *Madoto* (Mung'ong'o and Mwamfupe, 2003). This naturally gives a reflection of changes in climate variability and weather. A review of secondary sources from the Ilonga Agricultural Research Institute shows the presence of climate variability and its impact on maize and paddy production. Farmers in kilosa have employed adaptation measures to cope with the impact of climate variability, this measure includes changing planting dates, crop rotation, terrace, tree planting, planting resistant crops, and migration. Even though, the adaptation to climate variability is experienced differently between men and women as well as their adaptation differs (DFID 2013). Despite that, little empirical research has been done to explore how gender influences adaptation to climate variability among paddy smallholder farmers (Ngigi *et al.*, 2016). This research, therefore, examines context-specific factors that influence the adaptation to climate variability among women and men paddy smallholders' farmers in Kilosa District.

2.0. Literature Review and Theoretical Framework

Studies on factors influencing adaptation to climate variability have indicated that climate variability is experienced differently between men and women, they also respond differently to the impact of climate variability (Hebtzezion 2013; Omolo *et al.*, 2017; Velepini *et al.*, 2018; Mung'ong'o, *et al.*, 2019). Nevertheless, little empirical research has been done to explore the role of gender in studies about the factors influencing climate adaptation among paddy smallholder farmers in a Tanzanian context. Hence, this study has explored gender-based adaptation practices among smallholder farmers. The current literature on smallholder farmer climate variability and adaptation decisions shows that adaptation is driven by several risks

(Oyekale *et al.*, 2009). An assessment of farmers' awareness and adaptation practices in developing countries indicates that smallholder farmers adopt adaptation practices to respond to climate variability at the farm level based on objective determinants of adaptive capacity such as financial responses, agricultural changes, religious and cultural strategies, the use of local, and prevalence of wider support networks (Harmer *et al.*, 2014). According to Frank *et al.* (2014), the lack of resources and socio-economic limitations can impair farmers' adaptation decision-making even when they identify high risks.

This paper is guided by the action theory of adaptation and gender and development theory. The action theory of adaptation intends to allow for thoroughly clarifying the notion of adaptation in each specific research context, and delivers a model for hypothesizing on adaptation (Eisenack and Stecker, 2011). The argument is developed by framing adaptation as an individual or collective action, and by building on established analyses of (social) action. The basic components of the theory are (collective) actors, means, and ends of adaptation. Ends may be targeted at socio-economic or bio-physical units that are exposed to climate variability, but also at other receptors. The theory highlights that climate variability affects many actors in different ways and that their reactions are strongly interlinked (Abdul and Kruse, 2017). Actions tend to come in means-ends-chains. For understanding adaptation, it is necessary to address these interlinkages. The action theory has taken adaptations to climate variability as action, and that demands different actors to work together to bring sound adaptation. Nevertheless, despite its crucial contribution to collective action, it left out the aspect of gender. Consequently, there is a need to incorporate gender and development theory to capture the aspect of gender, which is the central focus of this study.

The Gender and Development (GAD) theoretical framework focuses on the socially constructed differences between men and women, the need to challenge existing gender roles and relations, and the creation and effects of class differences on development (i.e. ethnicity, social class, and age) (Bertrand, 2006). As an analytical framework, gender analysis encompasses information on men and women in terms of their roles, responsibilities, access to and control of resources, and opportunities, as well as hidden power structures that govern the relationships between them. Gender constructions in most societies tend to influence the access of males and females to critical resources necessary for their development, leading to gendered vulnerabilities. In the context of climate variability and adaptation, practices can be affected by these gender constructions on the abilities of men and women to cope with and adapt to adverse impacts of climate variability.

3.0. METHODOLOGY

This study employed a case study design. The decision to use this design was influenced by the criteria set forth by Yin (2017) on the nature of the research question that answers what, how, and why question. A case study design enables the researcher to rely on multiple sources of data for triangulation purposes (Stjelja, 2013). Case studies are designed to focus on and gather in-depth information about, a specific person, group, community, or event and the causal relations among variables investigated. The case study design was appropriate to this study because of the nature of the research question of the study i.e. What are factors determining adaptation to climate variability among men and women paddy smallholder farmers? The study intended to examine what are the impact of climate variability and how farmers adapt to climate variability and why selecting a certain practice for adaptation.

Primary data were collected through the Key informant interviews, household interviews, and focus group discussions. The key informants included District Executive Directors (DEDs), Ward Executive Officers (WEOs), and four agricultural workers from each ward. The four agricultural

extension workers one from each village were interviewed because they were considered as being an important potential source of information for the farmers in Kilosa. District executive officers and ward executive officers were selected based on their farming knowledge and experience of environmental change in the district and wards. Furthermore, regarded as having a potential influence on the farmers, due to their function as advisors on weather and agricultural practices, one key informant each from Tanzania Metrological Agency (TMA), Rice Post-harvest Management Marketing (RIPOMA), and Ilonga research institute, and 4 Village Executive Officers were interviewed. These provide information about factors that determine men's and women's adaptation to climate variability. Household interviews were conducted in the households after obtaining the participant's consent. Study participants were men and women paddy farmers residing in Kilosa. The criteria for selecting the household were based on the fact that she or he is a paddy farmer.

Before starting data collection the research team pre-tested the tools with 10 participants of different sex. The FGD was used as an entry point to data collection to ease communication, grasping major issues, and identifying potential interviewees. After the pre-taste a week later research team went to the field to begin actual data collection where, mixed-sex focus group discussions in each study site, with 10 to 14 participants were employed. At the end of the interviews, women-only focus group discussions were held in each study site to further uncover gender and women's experiences. The authors conducted focus group discussions with men only to discover gender and men's experiences. A tape recorder was used to record information during FGDs, the recorded information was later transcribed and translated. Face to face interviews was conducted at first sight then phone calls were made to the same key informant following the identification of gaps during data transcription. Secondary data were collected from KDC, TMA, and RIPOMA. In this study, data analysis was carried out using content analysis. The process began by probing the list of adaptation practices and factors influencing were generated in each group and recorded in the cards.

4.0. RESULTS AND DISCUSSION

The factors that influence the adaptation to climate variability include availability of finance, access to land, access to credit, access to climate information, and access to extension services. Other factors are decision making power, and alternative sources of livelihood. Table 1 presents the factors influencing the adaption to climate variability. The most important factors were availability of finance, access to land, access to credit, and access to climate information.

Table 1: Factors influencing adaptation to climate variability

S/N	Factors	Rank	Importance
1	Availability of finance	1	The Most important
2	Access to land	1	The Most important
3	Access to Credit	1	The most important
4	Access to climate information	1	The Most important
5	Access to extension services	2	The 2 nd most important
6	Decision making power	2	The 2 nd most important
7	Alternative source of livelihood	3	The least important

4.1. Availability of finance

It was revealed in the study area that climate variability requires large-scale investments to significantly reduce the impact. Although all farmers are affected by the mentioned factor, women are disproportionately affected. A consensus across all FGDs revealed that women are

disproportionately affected because the traditional gender roles within society inhibit the ability of women to acquire the same human capital as their male counterparts. As a way of adapting to the climate variability women engaged themselves in doing casual work in milling machines while men started cultivating short-term vegetables like African egg plant, cabbages, and tomatoes. Smith and Skinner (2004) assert that access to finance can internalize information on climate risks and help transfer adaptation and risk-reduction incentives to communities and individuals. Likewise, capital markets and transfer mechanisms can lighten financial constraints to the implementation of adaptation measures. In this regard, Smith and Skinner (2002) argue that the lack of adequate financial resources severely constrains the application of appropriate adaptation measures.

Past research also indicates that on average people with higher income are less affected by climate variability than those with less income (McCright, 2010; Wright and Chandani, 2015; Jost *et al.*, 2016; Doss, 2018). The findings from the FGDs indicate that there exist differences in finance or capital between men and women. This is because women seem to economically poor than men. One of key informant interview said:

“There is a difference in finance between men and women. It is easier for men to access finance than women. This is because women are the poorest group in the community. Capital is needed to acquire modern technology and technique in combating the impact of climate variability. Farmers with inadequate income cannot buy equipment such as power tillers and farm inputs. However, well-off farmers can hire farm equipment during land preparation and harvesting. Poor farmers use their labour power which takes a long time because they cannot afford to hire farm equipment.” (Key informant interview 8\1\2020).

Unlike farmers who have low financial status, the above statement indicates that a farmer with good financial status is capable of adapting to climate variability. Resch *et al.* (2017) argues that climate finance has an important role to play in minimizing losses and damages from climate variability. Furthermore, men are easier to adapt than women because they have a bigger network than women. Terry (2009) acknowledges that marginalized women face many gender-specific barriers that limit their ability to cope with and adapt to climate variability. The views are in line with those of Chiuri (2010).

4.2. Access to credit

The lack of credit is a common problem among farmers because the agricultural sector is mainly comprised of smallholder farmers. The access to credit can enable smallholder farmers purchase some farm inputs or equipment that sometimes can be needed to purchase new livestock. The findings reveal that farmers who can access credit were more likely to adapt to climate variability. FGD revealed women prefer informal sources of credit like ROSCA. Accessing credit has been a vital problem because there are no reliable credit associations in the villages. Furthermore, formal financial institutions, such as the Agriculture Development Bank (TADB) located in Dar es salaam, provide loans to farmers with high capita and investment. One of the barriers to climate adaptation among smallholder farmers is poor access to credit because smallholder farmers depend on subsistence farming for their livelihood (Alam *et al.*, 2016; Salami *et al.*, 2017; Nyasimi *et al.*, 2017). The FGDs results reported that as agriculture production requires relatively huge investments. This finding upholds with the results from one of the key informants' interviews who is of opinion that;

“There are no banks in this area. We have a small association like BRAC. One must have collateral to be given a loan. Farmers fail because they have nothing to offer as collateral. For example, women cannot be able to provide collateral without husband consent. Furthermore, women depend mostly on rotating savings and credit association

(ROSCA). The funds from ROSCA are inadequate in supporting agricultural production.”
(Key informant interview 6\1\2020)

The statement above indicates that inaccessibility to credit is a barrier to climate variability. ROSCAs cannot provide enough loans. Alam *et al.* (2016) demonstrates that one of the barriers to climate adaptation among smallholder farmers is poor access to credit. Further, Fletschner (2009) contends that women as compared to men are more likely to be credit constrained because women’s rationing status responds to a different set of factors than men.

4.3. Access to land

The findings revealed that women in Kilosa inherit land from their fathers. Overall, men inherit smaller portions of land than women. Women stay at home with their portions of land until when they get married. If a woman gets married, she owns that land jointly with her husband. The finding was supported by all of the FGDs across the study area. Moreover, although the land is predominantly owned by a woman, the popular view is that the decision on land is made jointly between men and women. The findings suggest that women are more likely to deal with climate variability because they have access to land. Even though, rapid population growth increases pressure on the demand for land at the district. Consequently, parents fail to give enough land to their daughters. There is an increasing tendency of men to buy plots land. The tendency changes the gender dynamics in the study area. That is, the ownership of land gradually shifts to men. Generally, if a person does not own land, he or she has difficulties to adopt new technologies that may potentially have various risks including renting a portion of land or failing to do so.

The rationale is that land ownership gives proprietors opportunities to try new technologies without much consultation and worry for loss of investment. In most African countries’ women do not own land due to discriminatory norms (Doss *et al.*, 2003). Moreover, women hold smaller farms than men hold and use fewer inputs such as fertilizers, improved seeds, and mechanical equipment (Doss *et al.*, 2002). Although in some countries like Uganda where some reports show that wives and husbands are joint owners of the land, it is rare to find a wife’s name listed on land title (Doss *et al.*, 2014). The FGD also revealed that most of Kilosa citizens are matrilineal. Daughters inherit plots or land from their mothers’ clan and stay at their parents’ place during marriage.

4.4. Access to information

The adaptation ability of an individual is highly influenced by his or her access to new information and knowledge. FGDS showed that women farmers access information by observing neighbours. The male smallholder farmers, access information through complex and larger communication networks including agricultural extension workers, rumours on weather information, radios, TVs, field exhibitions, and training. The findings showed that some of the trainings is administered by the Rice Postharvest Research and Marketing Project (RIPOMA). Mudzonga (2012) argues that access to information on climate variability influences the farmers’ awareness of climate variability and creates opportunities for the farmer to adopt suitable strategies that best suit the climatic conditions. Further, access to information on climate variability promotes farmers’ consciousness to variation in climate as well as finding measures (Partey *et al.*, 2018). Nhemachena and Hassan (2007) found that access to information about climate forecasting, adaptation options, and other agricultural activities remain important factors determining the use of various adaptation strategies. They also reported that men were able to receive important climate information, whereas women rely on indigenous knowledge like observing wind, cloud, and mud to detect if it will rain or weather flood will occur. Furthermore, it has been found that climate information contains difficult jargon that cannot be understood by farmers. One of the key informants was of opinion that:

"Sometimes we get information through radios or television but very unfortunate most of us are uneducated. We don't understand what is being said and convert it into action. For example, there is a certain session on television called weather forecast. It is very difficult for villagers like us to understand. It is full of the technical word although it's important to us most of us never watch. Another issue is that men are more likely to get climate related information as compared to women". (Key informant interview 13\12\2019).

"Men have better information, better knowledge because they are in the public domain. They go outside to the nearest city or to the nearest town they migrate and they get different information from the farmers, the market, and everything, better than women. Women are tied to household chores." (Key informant Ripoma13\12\2019).

The statement above indicates that women face difficulties in accessing reliable information. The importance of weather and climate information is largely reliant on the capability of scientists to deliver fit-for-purpose information (Daron *et al.*, 2015; Ranger *et al.*, 2010) and produced in formats that can be integrated into decision-making processes at all levels by considering gender.

Further, Daron *et al.* (2015) contend that gender should be integrated into decision-making processes at all levels. Esharenana *et al.* (2003) argue that information dissemination should take into account the different gender needs in information to enhance access to information for men and women.

4.5. Access to extension services and training

Extension services and training can play an important role in improving the livelihood of rural communities. Although some participants had attended seminars or workshops on climate adaptation, FGDs revealed that the majority of farmers receive little or no training and support from the mainstream agricultural extension services. They have also not received any training on gender mainstreaming. Diaz and Najjar (2019) suggest that gender should be integrated into the design and implementation of extension services. Agricultural extension services play a fundamental role in ensuring that farmers have access to improved technologies (Mudege *et al.*, 2016). The FGD findings are reflected in a response by one of the key informants' interviews:

"Most of the people having a greater chance to attend the training here are men. But women are generally left behind and when they attend it is something related to family planning and health. Extension officers view men as representatives of the family. There is a need to increase the quality of services to farmers, such as helping farmers by advising them to accomplish their respective roles. They require access to productive services information on input supply, implementation of new production technologies. In addition to that adaptation and implementation of (research results to local conditions), and educational tasks are compulsory" (Key informant interview 20\1\2020).

The statement above indicates that access to extension services is vital to farmers and it should be gender-sensitive. The finding is similar to past research elsewhere. Mudege *et al.* (2016) assert that community leaders tend to favour men to attend training.

4.6. Decision making power

The findings indicate that decision making power influences individual adaptation to climate variability. Men in the study area tend to hold a higher decision power than women. During semi-structured interviews, households gave contradictory responses about decision making. In

some households, women stated that men held a higher decision power. However, the majority of women were defensive by stating that decisions always were made jointly. One of the key informants said:

“Decision making is always together. Sometimes men take over the decisions because there are sensitive issues that a man can decide alone, but most of the time decision is made jointly.”(Key informant interview 6/1/2020)

FGDs revealed that male farmers in the study area had in many ways had a higher access to natural and man-made resources. As such, they had a higher decision power than the female farmers. The finding imply that men have adaptive capacity is likewise higher.

Edvardsson and Hansson, (2013) believes that institutions and decision-making processes need to be modified to guarantee that gender issues are adequately targeted within adaptation. The findings contradict those of Patt *et al.*, (2009) who argues that women are more risk-averse than men and therefore more likely to make decisions that minimize risks.

4.7. Access to agricultural inputs

The findings show that access to agricultural inputs determines the adaptation of men and women to climate variability. FGDs and field observations revealed that agricultural inputs need to be available and accessible to women and men for them to be able to adapt to climate variability effectively. Some of the agricultural inputs include access to seeds for growing drought resistant varieties, tree seedlings for planting trees, and seeds for growing vegetables. Similarly, it was observed that farmers’ use of agricultural inputs was limited. Only few well-off farmers used improved inputs and seedlings. Nevertheless, apart from the general low availability of improved seeds and breeds, the farmers’ use of these inputs appeared to be influenced by their ability to access such inputs. The main reason being that the land was unproductive. Some male farmers prefer industrial fertilizers to other forms of fertilizers because they could afford them. On the other hand, the majority of women farmers preferred composite or manure from livestock. One of the key informants said:

“It is true that Kilosa is a big town. Consequently, there are always some people from across the country who come to the district to search areas to cultivate. The tendency has led over cultivation. Consequently, one cannot grow crops without the application of fertilizers. Those who fail to apply fertilizers are subjected to low yields. Although, there are lots of fertilizer companies coming and advertising their products, women prefer livestock because it is affordable (Key informant Ilonga research institute 20/11/2019)”

Consequently, it can be argued that farmers using and being reliant on purchased fertilizer are limited in applying climate adaptation strategies since they have fewer economic resources. This finding concurs with the study by Hassan and Nhemachena (2008) who assert that better access to markets, extension and credit services, technology, and farm assets (labour, land, and capital) are critical for helping African farmers adapt to climate variability.

4.8. Availability of alternative livelihoods

Some farmers tend to seek for alternative sources of livelihoods by migrating to other districts. The tendency is a response to a lack of reliable alternative means of livelihoods in the district. The majority of farmers migrate if the face some difficulties engaging in paddy farming. The majority are men who risk going outside the village to look for substitute work. If there are work opportunities for women or wives, their husbands allow them to take non-farm work. Women are regularly left behind to look after the children and elderly and manage the farm while men are working outside the village. The FGDs reveal that women are at a more risk because they lack status, power, and resources. This is due to their reduced ability to create safe conditions during or after natural disasters including flooding. Women are particularly poor and vulnerable during and after disasters. Their vulnerability is not just because of their limited capacity but also

because they carry most of the family burden. On the other hand, men also have specific vulnerabilities that can affect their health and safety and that are linked to ascribed gender roles, traditional norms and values, and how the ideas of masculinity are constructed. Men experience considerable stress when they are left with little economic and livelihood opportunities during and after extreme weather events. They are expected to provide for the family. If they fail to adequately provide for their families, they suffer from depression. See quotation below:

“Normally, men believe that they are stronger than women. And they must prove that to their wives. During the time of stress, men must prove their masculinity through migrating to other regions to find alternative sources of income. However, women must stay at home to take care of the family and other activities. A man is not supposed to fail, I must work hard to make sure I find alternative sources of incomes for my family, failing is a big disappointment”. Key informant interview 23\1\2020.

The statement above is in line with Mishra (2009). Due to observed failure to make the masculine rank, men tend to make emotional tension and inner conflict which is expressed through fear, isolation, anger, self-punishment, self-hatred, and aggression. The anxiety and stress experienced by men can cause them to become violent and stressed. Moreover, Aguilar (2009) points out that, men are usually exposed to risky situations and even death because they believe that they are the stronger and need to take on heroic action.

5.0. CONCLUSION AND RECOMMENDATION

The results indicate that both women and men smallholder farmers adapt to climate variability differently. Farmers' capacity to choose effective adaptation options is influenced by access to information credit, land ownership, decision power, extension services, and alternative livelihoods. This implies the need to support the climate adaptation strategies of the smallholder farmers with a wide range of institutional, policy, and technology support, some of it targeted on women as they are seen as marginalized than men.

However, although women dominate in the provision of agriculture labour force, men dominate the decision making in allocating labour and choosing what crop to grow and sell. The level of access and control of resources between men and women constrain on productivity. This is exacerbated by the fact that women's and men's access to such resources do not correspond to the relative weight of men and women work in the sector. Furthermore, both men and women need to be capacitated on gender and climate variability. This will influence shared access to resources and information to bring up inclusive adaptation to both men and women. This study has contributed to a rising body of literature on gender and climate variability and has meaningfully added to the existing climate situation in Kilosa district. Furthermore, it has contributed to this attempt by presenting a unique framework that conceptualizes adaptations to climate variability as actions. Consequently, by exploring how gendered adaptation practices are established and copied by men and women who are living with climate variability, this study provides a more profound understanding of the adaptation practices taken by men and women.

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Policy Brief

An exploration of the factors that determine the gendered adaptation to climate variability in Kilosa District, Tanzania

This policy brief targets practitioners and policy-makers. It focuses on 'lessons learned' and 'policy and practice recommendations.' Changes in climate trends over the past few decades have been impartially speedy in several agricultural areas around the world. In recent years, Tanzania has witnessed several climate-related disasters namely, flooding, droughts,

widespread crop failures, livestock deaths, and intensification of climate-sensitive diseases among others.

Paddy is among the crops affected by climate variability particularly in Kilosa district. Climate variability has fuelled poverty, land conflicts between pastoralists and farmers, scarcity of pasture and water resources, outbreak of diseases, livestock death, and school drop-out. To lessen the adverse impacts of climate variability, local farmers have adjusted to severe weather conditions and have already developed adaptation practices over time. Adaptation to climate variability is reflected as a suitable response to climate variability, particularly for smallholder farmers.

Yet, adaptation by women and men farmers is influenced by different factors that are not well understood. There is, among other things, a gender dimension to the choice of an adaptation strategy to climate variability. The study findings indicate that farmers' capacity to choose an effective adaptation options to climate variability is influenced by access to information credit, land ownership, decision power, extension services, and alternative livelihoods.

This implies there is need to support the climate adaptation strategies of the smallholder farmers with a wide range of institutional, policy, and technology support. The measures should also target on women who are disproportionately affected.